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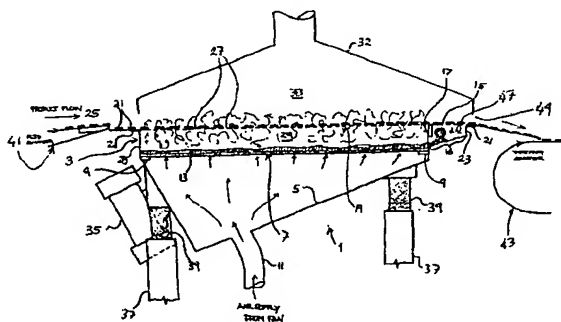
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **FOOD ITEM COATING APPARATUS AND METHOD**



(57) Abstract: Food item coating apparatus (1) comprises a support surface (19), fluidisation means arranged in use to create a fluidised cloud (29) of edible powdered coating material, and vibration means (35) which in use causes the support surface (19) to vibrate. The apparatus (1) is so arranged that, in use, the vibration means (35) causes food items (31) to move along the support surface (19) by way of a jumping motion through the fluidised cloud (29) of powdered coating material. The support surface (19) is provided with a field of apertures (27). One advantage of the inventive apparatus is that the jumping motion allows the undersides of the items (31) to be coated simultaneously with the upper sides of the items.

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FOOD ITEM COATING APPARATUS AND METHOD

This invention relates to an apparatus and a method for coating food items with a powdered substance, and particularly, but not exclusively, to coating hard confectionery products with a finely powdered edible
5 substance.

It is known to provide a confectionery product, such as a lozenge or boiled sweet, with a finely powdered coating such as starch or icing sugar. The most common method used in the art to achieve this is to dust the finished sweets with the powdered coating. This has the
10 disadvantage that the sweets can only be dusted on one side at a time, and so provision must be made for turning them over. It can also be difficult to ensure that the sweets are evenly coated.

According to one aspect of the invention we provide food item coating apparatus comprising a support surface, fluidisation means arranged in
15 use to create a fluidised cloud of edible powdered coating material, and vibration means which in use causes the support surface to vibrate, the apparatus being so arranged that, in use, the vibration means causes food items to move along the support surface by way of a jumping motion through the fluidised cloud of powdered coating material. The food
20 items are thus provided with a coating of the powdered coating material on their outer surfaces.

According to a second aspect of the invention we provide a method of coating food items comprising vibrating a support surface in such a way that food items thereon are caused to move along the support surface by
25 way of a jumping motion through a fluidised cloud of edible powdered coating material.

A preferred embodiment of the invention will now be further described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a longitudinal cross section through confectionery item coating apparatus, and,

Figure 2 shows a perspective view of the confectionery coating apparatus of figure 1 with the hood removed.

Referring to the figures, a confectionery coating apparatus 1 comprises a trough 3 and an air manifold 5, the base of the trough being defined by inclined rigid porous membrane 7 made, for example, of microporous plastic material. A porous sintered material could be used however. The membrane 7 could be semi-rigid. In the embodiment shown the membrane 7 is fixedly held in position by supports 9. The rigid porous membrane 7 supports a layer of powdered starch 13. Air from the manifold 5 fluidises this starch towards a perforated deck 19. The trough and the membrane are vibrated by two out of balance motors 35.

In use, the air manifold 5 receives pressurised air via a conduit 11 from a fan (not shown). It is to be understood that 'air' in this context includes any inert gas, such as nitrogen, which may be used to create a fluidised bed suitable for use with edible products.

The trough 3 comprises an end wall 28 and two side walls (not shown). The membrane 7 is permeable to air, or other inert fluidising gas, but is not permeable to the edible coating material, in this case starch. The trough communicates at the opposite end thereof with a starch feed region 47. The region 47 comprises a base 16 of non-porous construction which is impermeable to air or starch. The base 16 is

formed integrally with an end wall 23, and said base is inclined downwards slightly from the wall 23 towards the porous membrane 7 to assist with starch feed or supply.

Starch is introduced into the starch feed region 47 by starch feed tube 15 comprising an elongate aperture provided on the underside thereof. The starch feed tube 15 houses a cross screw feed (not illustrated), or other suitable means, to ensure that starch is deposited evenly along the length of the feed, from one side of the trough to the other. The starch feed region 47 has minimal fluidisation of the starch around the starch feed 15 so as not to hinder the introduction of the starch. The provision of an area that is substantially free from the fluidised starch cloud is further desirable for reasons explained below.

A starch level control gate 17 is provided substantially on the boundary between the trough 3 and the starch feed region 47. This allows the level of the layer of starch on the porous membrane 7 to be controlled or modified, allowing the properties of the fluidised cloud to be adjusted as desired by moving the gate up or down. The gate 17 also assists in ensuring that the starch within the section of the starch feed region 47 is substantially unfluidised, thus improving control of the starch introduction and confining the fluidised starch cloud to the part of the trough above the porous membrane 7.

The perforated deck 19 is fixed to supports 21 at the top of the walls 23 and 28. The perforated deck 19 may be substantially horizontal or may be inclined slightly in the direction of the product flow, indicated by arrow 25. The perforated deck 19 extends beyond the longitudinal ends of the trough 3 to facilitate the delivery of products from a feed conveyor 41 onto the perforated deck and to a take away conveyor 43 from the perforated deck. Perforations 27 in the deck 19 are sufficiently

large so as to allow the flow of the fluidised starch therefore resulting in the function of a starch cloud 29 around the confectionery items 31, but not so large as to hinder the flow of the items 31 by, for example, allowing an item to fall through or get stuck in the perforations. The
5 perforated deck comprises retaining side walls 45 (as shown in figure 2) which ensure that the items cannot fall over either side of the deck 19.

A hood 32 is disposed above the perforated deck 19 and clear of the items being conveyed thereon. Together, the hood 32 and the trough 3 form a coating chamber 33 through which the products to be coated 31
10 pass.

The two out of balance motors 35 attached to the trough so that, in use, the trough and the fixedly attached perforated deck 19 are caused to vibrate. The apparatus is isolated from its supporting frame 37 by rubber mounts 39 so that the vibrations are confined to the coating apparatus
15 only.

In use the coating apparatus operates as follows. Pressurised air from the fan (not shown) is blown through the rigid porous membrane 7, having been distributed by the manifold 5. The air blows up through the starch layer 13 creating a fluidised cloud of starch 29 above it, which envelops
20 the perforated deck 19. The perforations 27 ensure that the fluidisation of the cloud is not inhibited by the deck, and helps to ensure that the undersides of the items 31 can be coated.

The confectionery items to be coated 31, are delivered by feed conveyor 1 onto the perforated deck 19. In use, the motors 35 cause the
25 manifold 5, the porous membrane 7 and the deck 19 to vibrate. This vibration serves a number of purposes. Primarily, it causes the products to move along the deck in the direction of arrow 25. This motion may be

assisted by a slight downwards incline in the deck from the feed conveyor towards the exit 49 of the apparatus. The vibration assists to some extent with the fluidisation of the starch by stirring up the starch layer 13. The vibration also has the added benefit of causing the products to 'jump' as they are conveyed along the deck, allowing the undersides of the products to be evenly coated by the fluidised starch cloud 29 without the need for additional apparatus, such as a stepped conveyor, to turn the products over, as in conventional dusting techniques.

The products 31 move slowly through the fluidised cloud 29, becoming evenly coated with starch as they progress. The speed of the products across the membrane, and hence the time spent in the fluidised cloud, can be varied by adjusting the motor frequency of the balance motors and/or the incline of the perforated deck. As the products approach the exit 49 of the apparatus they pass out of the fluidised starch cloud approximately at the point when they move onto the portion of the perforated deck 19 which lies over the non-porous part of the base 16 of the trough. In this part of the apparatus, the products are no longer being coated, and now the vibration serves the additional purpose of dislodging any loose starch from the products. This excess starch is not wasted, and falls through the perforated deck onto the inclined non-porous base 16 where it rejoins the starch layer 13 for recirculation. The products then pass out of the exit 49 of the apparatus and are delivered to the take away conveyor 43, which removes them for further processing or packaging.

It will be appreciated that the apparatus 1 could be used to coat other edible items such as medicinal tablets or dried fruit. It will be appreciated that instead of starch powdered sugar or powdered colourings/flavourings could be used for the fluidised bed.

CLAIMS

1. Food item coating apparatus (1) comprising a support surface (19), fluidisation means arranged in use to create a fluidised cloud (29) of edible powdered coating material, and vibration means (35) which in use
5 causes the support surface (19) to vibrate, the apparatus being so arranged that, in use, the vibration means (35) causes food items (31) to move along the support surface (19) by way of a jumping motion through the fluidised cloud (29) of powdered coating material.
2. Coating apparatus as claimed in claim 1 in which the food items
10 (31) are confectionery items.
3. Coating apparatus as claimed in either claim 1 or claim 2 in which the support surface (19) is provided with a field of apertures (27).
4. Coating apparatus as claimed in any preceding claim in which the support surface (19) is inclined downwards towards an exit (49) of the
15 apparatus.
5. Coating apparatus as claimed in any preceding claim in which the fluidisation means is disposed beneath the support surface (19).
6. Coating apparatus as claimed in claim 5 in which the fluidisation means comprises a porous layer (7) which is adapted to support a layer
20 (13) of powdered coating material, the porous layer (7) being porous to gas.
7. Coating apparatus as claimed in claim 6 comprising a coating material feed region (47) into which, in use, the edible powdered coating material is introduced, the coating material feed region being provided

with a moveable gate (17) which in use is operative to control the amount of coating material conveyed to the porous layer (7).

8. Coating apparatus as claimed in claim 7 in which, in use, the coating material feed region (47) is substantially free of fluidisation.

5 9. Coating apparatus as claimed in claim 7 or claim 8 in which the coating material is introduced into the feed region (47) through a feed tube (15) having an elongate aperture provided longitudinally on the underside thereof, the feed tube housing coating material delivery means.

10 10. Coating apparatus as claimed in claim 9 in which the coating material delivery means is a cross screw feed.

11. Coating apparatus as claimed in any preceding claim which in use is adapted to convey the items along the support surface (19) after exiting the fluidised cloud (29) into a region (47) substantially free of fluidisation, the vibration of the support surface causing any excess
15 coating material to be shaken free of the products and to fall substantially beneath the support surface.

12. Coating apparatus as claimed claim 6 in which, in use, the vibration means (35) is adapted to cause the porous layer (7) to vibrate.

13. Coating apparatus as claimed in any preceding claim which is
20 suitable for applying an edible powdered coating material of starch.

14. A method of coating food items (31) comprising providing a support surface (19) and vibrating the support surface (19) in such a way that food items are caused to move along the support surface (19) by way of a

jumping motion through a fluidised cloud (29) of edible powdered coating material.

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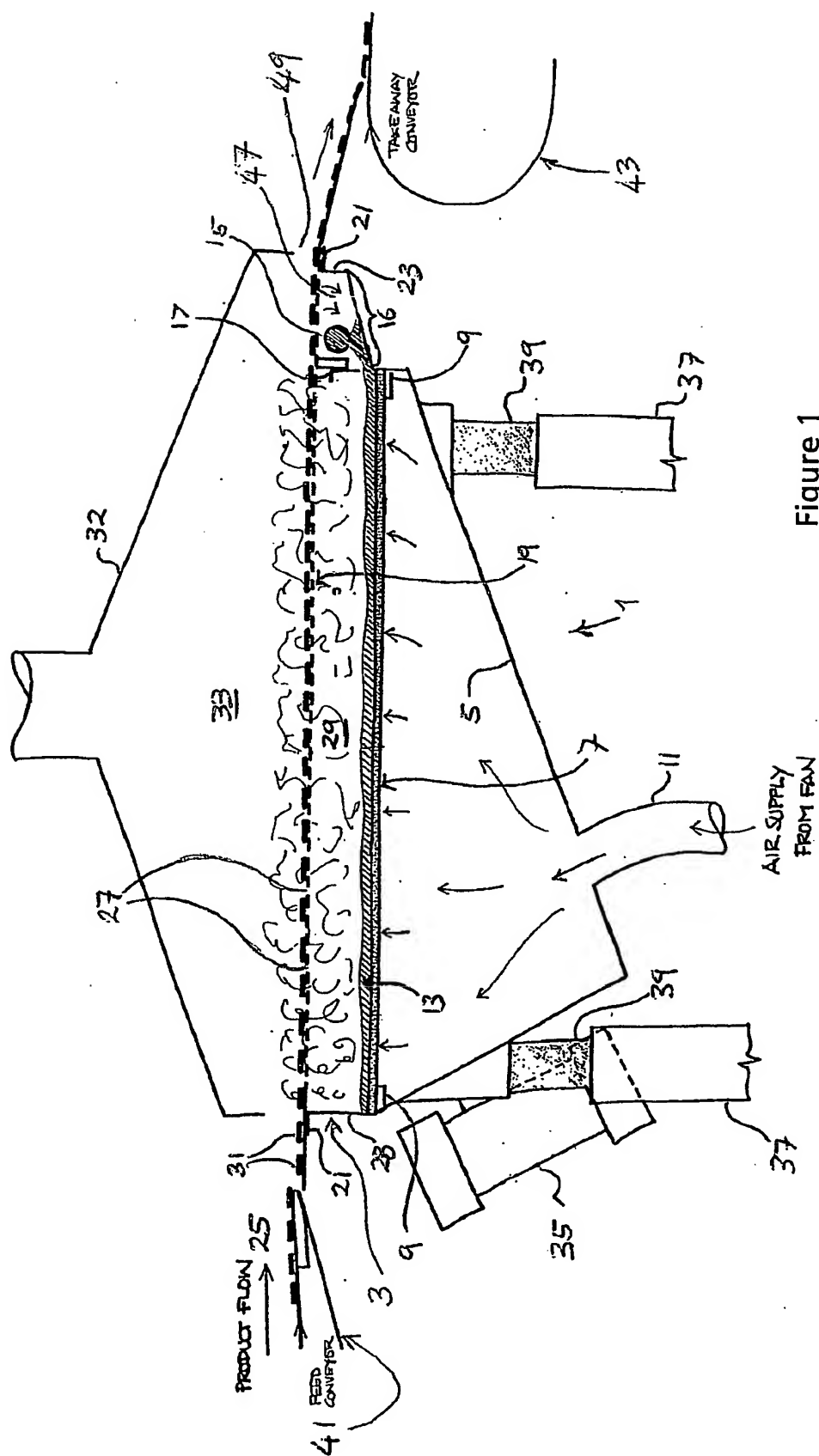


Figure 1

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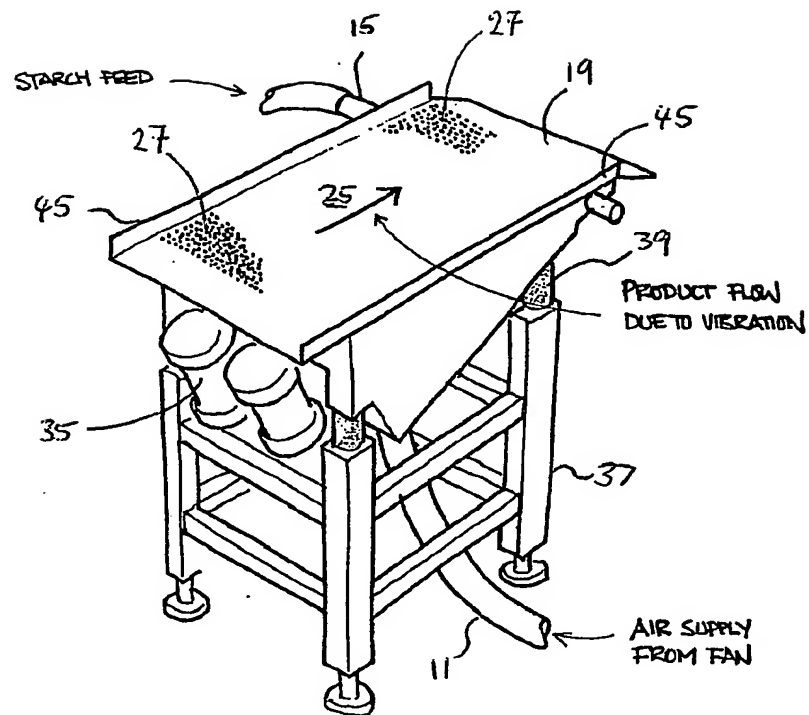


Figure 2

A. CLASSIFICATION OF SUBJECT MATTER

B05C19/02

A23P1/08

A23G3/20

A01J25/16

B01J8/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B05C A23G A01J A23P B01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 269 739 B1 (BETTCHER LANE ET AL) 7 August 2001 (2001-08-07) column 2, line 30 - line 46	1-3,5, 11,13
Y	column 9, line 45 - line 62; figures	6-10
Y	EP 1 190 621 A (SOCIETE D'ETUDE) 27 March 2002 (2002-03-27)	6-10
A	paragraphs '0029!', '0030!; figure 1	1-5, 11-14
X	US 2 799 241 A (WURSTER DALE E) 16 July 1957 (1957-07-16)	1-6, 11-14
A	column 1, line 68 - line 72 column 2, line 7 - line 14 column 2, line 21 - line 45; figures	7-10
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents :

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Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

* & * document member of the same patent family

Date of the actual completion of the international search

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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